

## REMARKS

The final Office Action dated September 29, 2009, has been carefully reviewed and the following remarks are responsive thereto. No new matter has been added. Claims 1-26 remain pending upon entry of the present amendment. Reconsideration and allowance are respectfully requested.

### Claim Rejections - 35 U.S.C. § 103

Claims 1-11, 19-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hoppenstein (US 2004/0204109 A1) in view of Frand et al. (US 2004/0127174 A1). This rejection is respectfully traversed for at least the following reasons.

#### Claim 1:

Claim 1 recites a device for realizing beam-forming in CDMA system:

said device comprising in a forward signal flow, at least a base band system, an optical transceiver system, a transceiver system, an analog fixed beam-forming network, a power amplifier, a transmission filter at a radio frequency front end, and an antenna system;

said device comprising in a reverse signal flow, at least the antenna system, a reception filter at a radio frequency front end, a low noise amplifier, the analog fixed beam-forming network, the transceiver system, the optical transceiver system and the base band system;

the optical transceiver system comprising an optical fiber and an optical interface board close to the base band system and an optical interface board close to the transceiver system, and enabling the base band system be placed in a warehouse so as to make the base band system support more sectors, and a radio frequency part close to the antenna, thereby reducing power loss;

said optical interface board being used to interconvert electronic signals and optical signals input;

when transmitting forward signals, different beams are made to have different time delays in the base band system so that they are not coherent with one another even when different beams carry same information.

Neither Hoppenstein nor Frank, either separately or in combination, teaches or suggests such features.

First, claim 1 is distinguishable from Hoppenstein. For example, claim 1 recites that “when transmitting forward signals, different beams are made to have different time delays in

the base band system so that they are not coherent with one another even when different beams carry same information”. The Office Action concedes that Hoppenstein lacks a teaching or suggestion of such a feature. Instead, the Office Action relies on Frank. However, the applicant respectfully submits that Frank does not teach or suggest this technical feature. Although [0025] of Frank discloses that “the fundamental restriction on the time offsets of the beams is that adjacent beams do not share the same time offset”, Frank does **not** teach or suggest that when transmitting forward signals, different beams are made to have different time delays in the base band system so that they are not coherent with one another even when different beams carry same information. A person having ordinary skill in the art knows that time delay in the base band system is performed on digital signals. Referring to Frank, it **neither** recites a *base band* system **nor** *base band* signals. Referring to lines 1-4 of paragraph [0025] of Frank, there is a recitation of “As illustrated in FIG. 4, an antenna system 40 has four line feeds 41-44. The signal on these line feeds 41-44 are each modified by a corresponding time delay circuitry 45-48 prior to being fed into beam source 49”. Referring to lines 12-20 of paragraph [0030] of Frank, there is a recitation of “Also, the illustration has been modified to illustrate which beam is transmitted from which four element array polarizers, when in fact, beam B14 is adjacent to and in between beams B13 and B15, while beam B15 is adjacent to and in between beam B14 and B16. As illustrated in Fig. 6, the data on the antenna line feeds 61-64 is by modified by the circuitry 65-68, respectively , to provide either frequency offsets or time delay offsets to the data on the respective line feeds.” And with reference to Fig. 6, we can see that the delay lines are before antenna line feeds 61-64 and bulter matrix. From these discloses of Frank, a person having ordinary skill in the art will know that the delay lines of Frank are analog circuit.

**Accordingly**, the technical scheme of Frank is not the same with that of the present invention. In Frank, the time delay is performed on *analog signals*, it is realized by analog delay line; while in the present invention, the time delay is performed on *digital signals*, its realization is completely different from analog delay line of Frank. **Besides**, the technical effects of Frank are not the same with that of the present invention. A person having ordinary skill in the art knows that *when performing time delay on analog signals, delay lines are needed, and it is not convenient to adjust time delay values, which may involve hardware modification*. A person having ordinary skill in the art also knows that **when performing time delay on digital signals, digital logic replaces the delay lines, and the digital logic can adjust the time delay values more conveniently, so that such digital time delay can be adapted to various kinds of base band systems well**. Further, Frank does not provide any relative teachings for a

person having ordinary skill in the art to make different beams to have different time delays in the base band system.

Second, the Office Action points out that Hoppenstein in Paragraph [0024] discloses that the base station control unit transmits and receives signals from each planar antenna array in a digital base band system. But, the applicants respectfully submits that **(1)** the technical scheme of Hoppenstein is not the same with that of the present invention, the technical scheme of the present invention is to make different beams to have different time delays in the base band system, while the technical schemes of Hoppenstein is not; **(2)** The technical problem to be solved by the signal processing of the digital base band system in Hoppenstein is not the same with the technical problem to be solved by the digital base band system of the present invention, the technical problem to be solved by the present invention is the fixed beams correlate with and counteract one another, while the technical problem to be solved by Hoppenstein is not. The key point of the system in claim 1 of the present invention is not relative to that of Hoppenstein. The key point of the system in claim 1 is for beam-forming, while the key point of Hoppenstein is power amplifier (PA). So, Hoppenstein does not provide any relative teachings for a person having ordinary skill in the art to make different beams to have different time delays in the base band system to solve the problem that the fixed beams correlate with and counteract one another. Besides, in our beam-forming network, optical fiber is used so that the apparatuses of the system in claim 1 can be remote from each other; while in Hoppenstein, no such description is mentioned. Accordingly, claim 1 is allowable for at least these reasons.

The above distinguishing technical features are not well known in the art.

Thus it has been non-obvious to a person having ordinary skill in the art at the time of the invention was made to modify Hoppenstein by using the teachings of Frank.

Therefore, the amended claim 1 has been non-obvious at the time the invention was made and in condition for allowance.

#### **Claims 2-4:**

Claims 2-4 are dependent on claim 1, and are thus allowable for at least the same reasons as the amended claim 1.

**Claims 5:**

Claim 5 depends on claim 1, and further defines “said analog fixed beam-forming network may be Butler matrix, or Blass matrix, or electromagnetic lens of the Lunegberg or Rotman type”.

Hoppenstein does not disclose this additional feature. Furthermore, although Frank recites “Butler Matrices”, it does not disclose *Blass matrix* or *electromagnetic lens of the Lunegberg* or *Rotman type*. Therefore Frank does **not** disclose that “said analog fixed beam-forming network may be Butler matrix, or Blass matrix, or electromagnetic lens of the Lunegberg or Rotman type”. Thus neither Hoppenstein nor Frank, either separately or in combination, teaches or suggests the additional feature of claim 5.

The above distinguishing technical features are not well known in the art.

Thus it has been non-obvious to a person having ordinary skill in the art at the time of the invention was made to modify Hoppenstein by using the teachings of Frank.

Additionally, claim 5 is dependent on claim 1. As stated above, neither Hoppenstein nor Frank, either separately or in combination, teaches or suggests the device defined in the amended claim 1, so claim 5 which depends on claim 1, is allowable for at least the same reasons as the amended claim 1.

**Claim 6:**

Claim 6 is dependent on claim 1, and is thus allowable for at least the same reasons as the amended claim 1.

**Claim 7:**

Claim 7 recites a device for realizing beam-forming in CDMA system,

said device comprising in a forward signal flow at least a base band system, a digital fixed beam-forming network, an optical transceiver system, a transceiver system, a power amplifier, a transmission filter of radio frequency front end and an antenna system;

said device comprising in a reverse signal flow at least the antenna system, a reception filter of radio frequency front end, a low noise amplifier, the transceiver system, the optical transceiver system, the digital fixed beam-forming network, and the base band system;

said optical transceiver system comprising an optical fiber, an optical interface board close to the base band system and an optical interface board close to the transceiver system, and enabling the base band system be placed in a warehouse so as to make the base band system support more sectors, and a radio frequency part close to the antenna, thereby reducing the power loss;

said optical interface board being used to interconvert electronic signals and optical signals input;

when transmitting forward signals, different beams are made to have different time delays in the base band system so that they do not correlate with one another even when the different beams carry same information.

Neither Hoppenstein nor Frank, either separately or in combination, teaches or suggests such features.

**First**, claim 7 is distinguishable from Hoppenstein. For example, claim 7 recites the device for realizing beam-forming in CDMA system comprises a digital fixed beam-forming network. That is to say, in claim 7, the device for realizing beam-forming in CDMA system comprises a fixed beam-forming network which uses a digital beam-forming technique. The applicant respectfully submits that tower top 22 described by Hoppenstein is **not** a digital fixed beam-forming network

**Second**, claim 7 recites that “when transmitting forward signals, different beams are made to have different time delays in the base band system so that they do not correlate with one another even when the different beams carry same information”. The Office Action concedes that Hoppenstein lacks a teaching or suggestion of such a feature. Instead, the Office Action relies on Frank. However, the applicant respectfully submits that Frank does not teach or suggest this technical feature. Although [0025] of Frank discloses that “the fundamental restriction on the time offsets of the beams is that adjacent beams do not share the same time offset”, please be noted that the time delay is performed on *analog signal*. While in the present invention, the time delay is performed on digital signal. We can see that the technical scheme and the technical effects of Frank are not the same with those of the present invention. Accordingly, claim 7 is allowable for at least these reasons.

Additionally, at least based on the similar reasons as discussed in claim 1, the applicant respectfully submits that claim 7 has been non-obvious at the time the invention was made and in condition for allowance. For example, as stated above in claim 1, neither Hoppenstein nor Frank, either separately or in combination, teaches or suggests “a digital fixed beam-forming

network” and “when transmitting forward signals, different beams are made to have different time delays in the base band system so that they do not correlate with one another even when the different beams carry same information”.

The above distinguishing technical features are not well known in the art.

Thus it has been non-obvious to a person having ordinary skill in the art at the time of the invention was made to modify Hoppenstein by using the teachings of Frank.

Therefore, claim 7 has been non-obvious at the time the invention was made and in condition for allowance.

**Claims 8-11 and 23-25:**

Claims 8-11 and 23-25 depend on claim 7 directly or indirectly, and are thus allowable for at least the same reasons as claim 7.

**Claim Rejections - 35 U.S.C. § 102**

Claims 12-18 and 26 stand rejected under 35 U.S.C. 102(e) as being anticipated by Frank. This rejection is respectfully traversed for at least the following reasons.

**Claim 12:**

Claim 12 recited a method for realizing beam-forming in CDMA system, at least comprising the following steps of:

step one: in a base band, reflecting base band signals of each fixed beam to sectors of base band chips;

step two: making the base band signals of the fixed beams reflected to corresponding sectors of the base band chips have different time delays.

The applicant respectfully submits that Frank fails to disclose or even suggest the element “step one: in a base band, reflecting base band signals of each fixed beam to sectors of base band chips”. Although Fig 4 of Frank discloses that modifying signals by time delay circuitry, Frank does not disclose “reflecting base band signals of each fixed beam to sectors of base band chips”. What Frank discloses and what described in the step one of claim 12 of the present invention are not the same at all. **Firstly**, in claim 12 of the present invention, base band signals of each fixed beam are ***reflected to sectors of base band chips***, then the time delay is performed; while in Frank, **only a time delay circuitry** is used, no “*sectors of base band*

*chips*” is mentioned, and the fixed beams are not reflected to sectors of base band chips before being time delayed by the delay lines. In this way, from the point of a person having ordinary skill in the art, the technical scheme of claim 12 and that of Frank are different. **Secondly**, the step one defined in claim 12 can realize unique technical effects, in the real implementation, the step one defined in claim 12 of the present invention can particularly be applied in CDMA system, since people in the art often utilize chips that have been existed at present in CDMA system, for example, the base band chips of Qualcomm Company are often utilized. By implementing the step one defined in claim 12 of the present invention (that is, by implementing “in a base band, reflecting base band signals of each fixed beam to sectors of base band chips”), the method defined in claim 12 of the present invention can utilize the base band chips that have been existed at the present to realize beam-forming in CDMA system, without changing the hardware structure of base band system that has been existed at present. However Frank uses only time delay circuitry and fixed beams are not reflected to sectors of base band chips, which can not achieve the above technical effects of the claim 12. So, the technical effects of claim 12 and that of Frank are different.

The element of “step two: making the base band signals of the fixed beams reflected to corresponding sectors of the base band chips have different time delays” cannot be found in Frank as well. As stated above in claim 1, Frank does **not** make the *base band* signals of the fixed beams have different time delays; instead, Frank makes *analog* signals have different time delays.

Accordingly, the applicant respectfully submits that every element in claim 12 of the present invention cannot be found in Frank and thus claim 12 is allowable.

**Claims 13-18 and 26:**

Claims 13-18 and 26 depend on claim 12 directly or indirectly, and are thus allowable for at least the same reasons as claim 12.

### **Conclusion**

The Applicants believe they have responded to each matter raised by the Examiner. Allowance of the claims is respectfully solicited. It is believed that the present patent application, after the above amendments and statement of opinions, has overcome all the defects pointed out by the Examiner and is in conformity with the relevant provisions, so it should be granted patent rights. The Applicants expect early granting of patent right for this application. If there is still a problem that the Examiner believes is not overcome by the above amendments and statement of opinions, please give the Applicants another chance to make amendments and further clarification or explanation or observation.

Respectfully submitted,

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